

TIME COURSE OF ATROPHIC REMODELING: EFFECTS OF EXERCISE ON CARDIAC MORPHOLOGY AND FUNCTION

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BACKGROUND: Early and consistent evaluation of cardiac morphology and function throughout an atrophic stimulus is critically important for the design and optimization of interventions. Exercise training is one intervention that has been shown to confer favorable improvements in LV mass and function during unloading. However, the format and intensity of exercise required to induce optimal cardiac improvements has not been investigated.

PURPOSE: This randomized, controlled trial was designed to 1) comprehensively characterize the time course of unloading-induced morpho-functional remodeling, and 2) examine the effects of high intensity exercise training on cardiac structural and functional parameters during unloading. **METHODS:** Twenty six subjects completed 70 days of head down tilt bed rest (HDBR): 17 were randomized to exercise training (ExBR) and 9 remained sedentary. Exercise consisted of integrated high intensity, continuous, and resistance exercise. We assessed cardiac morphology (left ventricular mass; LVM) and function (speckle-tracking assessment of longitudinal, radial, and circumferential strain and twist) before (BR-2), during (BR7,21,31,70), and following (BR+0, +3) HDBR. Cardiorespiratory fitness (VO_{2max}) was evaluated before (BR-3), during (BR4,25,46,68) and following (BR+0) HDBR. **RESULTS:** Sedentary HDBR resulted in a progressive decline in LVM, longitudinal, radial, and circumferential strain, and an increase in twist. ExBR mitigated decreases in LVM and function. Change in twist was significantly related to change in VO_{2max} ($R=0.68$, $p<0.01$). **CONCLUSIONS:** Alterations in cardiac morphology and function begin early during unloading. High-intensity exercise attenuates atrophic morphological and functional remodeling.